Amendments to the Claims

The listing of claims will replace all prior versions, and listings, of claims in the application.

1. (currently amended) A method for cleaning an interval of a well having a casing, comprising:

with a tubing conveyed ~~Out/In~~ straddle tool having spaced packer elements positioned within the well casing establishing an annular interval between the spaced packer elements and between the ~~Out/In~~ straddle tool and the casing, causing a flow of clean fluid through the tubing and said ~~Out/In~~ straddle tool into an upper portion of the annular interval via an ~~Out~~outlet port of said ~~Out/In~~ straddle tool and thence from a lower portion of the annular interval into the ~~Out/In~~ straddle tool via an ~~In~~inlet port located below said ~~Out~~outlet port;

at a fluid flow rate above a predetermined flow rate, blocking the flow of fluid into the casing below said spaced packer elements and permitting fluid pressurization of the annular interval for formation interval treatment; and

at a fluid flow rate up to the predetermined flow rate, directing fluid flow through said ~~In~~inlet port into the well casing below said spaced packer elements.

2. (currently amended) The method of claim 1, further comprising:

~~in the event the casing below said spaced packer elements becomes filled with fluid,~~ displacing any excess fluid from the casing below said spaced packer elements through at least

one bypass passage of said ~~Out/In~~ straddle tool into the casing above said spaced packer elements.

3. (currently amended) The method of claim 1, further comprising:

diverting the flow of fluid from said ~~Out/In~~ straddle tool through said ~~Out~~outlet port along a flow path having ~~gentle~~ bends less than 90 degrees to minimize erosion of tool components and to minimize erosion of the casing opposite said ~~Out~~outlet port.

4. (currently amended) The method of claim 1, wherein a flow diverter member is positioned within said ~~Out/In~~ straddle tool at said ~~Out~~outlet port and defines a fluid flow diverting geometry diverting fluid flow at a gradual angle into the annular interval, said method further comprising:

during flow of fluid from said ~~Out/In~~ straddle tool, diverting the flow of fluid with said fluid flow diverting geometry along a flow path having ~~gentle~~ bends less than 90degrees and minimizing erosion of said ~~Out~~outlet port.

5. (currently amended) The method of claim 4, wherein said flow diverter member is composed at least partially of a material having a predetermined sacrificial rate of erosion by abrasive fluid, said method further comprising:

during flow of fluid from said ~~Out~~outlet port into the annular interval, substantially confining erosion to sacrificial erosion of said flow diverter member.

6. (currently amended) The method of claim 1, wherein the structure of said ~~Out/In~~ straddle tool further integrates ~~Out~~outlet ~~and In~~inlet ~~ports,~~a bypass passage ~~and packer mounting,~~ permitting internal fluid flow passages thereof to be of sufficiently large diameter to minimize the velocity of fluid flow therethrough, said method further comprising:

at a predetermined rate of flow through said ~~Out/In~~ straddle tool, causing the velocity of fluid flow to be sufficiently low to minimize fluid flow induced erosion of tool components.

7. (currently amended) The method of claim 1, wherein said spaced packer elements comprise upper and lower cup packers each having a flexible cup element defining an annular cup skirt, said method further comprising:

during fluid flow from said annular interval through said ~~In~~inlet port, directing fluid flow into said annular cup skirt of said lower cup packer and causing fluid flow cleaning of said lower cup packer of treatment fluid residue.

8. (currently amended) A method for treatment of an interval of a well having a well casing and cleaning treatment residue from the interval, comprising:

running a~~n~~ ~~Out/In~~ straddle tool having spaced packer elements into the well casing on a fluid supplying tubing string and defining an annular sealed interval between the spaced packer elements and between the ~~Out/In~~ straddle tool and the well casing, the ~~Out/In~~ straddle tool having an upper ~~Out~~outlet port and a lower ~~In~~inlet port each being in communication with

the annular sealed interval, a pressure responsive valve open to the annular sealed interval and to the well casing below said spaced packer elements at a predetermined rate of fluid flow and closed to the well casing below said spaced packer elements at a rate of fluid flow exceeding said predetermined rate of fluid flow;

pumping treatment fluid through the fluid supplying tubing string through said ~~Out~~outlet port and into the annular sealed interval at a flow rate maintaining said pressure responsive valve closed and subjecting the annular sealed interval to desired treatment;

upon completion of annular sealed interval treatment, causing flow of clean fluid through said tubing string at a rate sufficient to permit said pressure responsive valve to open and dump treatment fluid and clean fluid from the annular sealed interval into the well casing;

continuing the flow of clean fluid through said tubing string, through said ~~Out~~outlet port, through the annular sealed interval, and through said ~~In~~inlet port at a flow rate maintaining said pressure responsive valve open and cleaning said formation treatment tool and the annular sealed interval; and

~~in the event the well casing below said formation treatment tool becomes filled with fluid,~~ bypassing clean fluid through a bypass passage from the well casing below said spaced packer elements to the well casing above said spaced packer elements as necessary to remove fluid filling the well casing below said formation tool.

9. (currently amended) The method of claim 8, further comprising:

maintaining fluid flow at a sufficiently low velocity to minimize fluid flow induced erosion of said upper ~~Out~~outlet port and said lower ~~In~~inlet port.

10. (currently amended) The method of claim 8, wherein a flow diverter member is positioned within said ~~Out/In~~ straddle tool at said ~~Out~~outlet port and defines a fluid flow diverting geometry, said method further comprising:

diverting the flow of fluid with said fluid flow diverting geometry along a flow path having ~~gentle~~ bends less than 90 degrees and minimizing abrasive fluid erosion of said ~~Out~~outlet port, lower ~~In~~inlet port, and the well casing.

11. (original) The method of claim 10, further comprising:

permitting fluid flow induced erosion of said flow diverter member at a predetermined rate.

12. (currently amended) The method of claim 8, wherein said spaced packer elements comprise upper and lower cup packers each having a flexible cup element defining an annular cup skirt, said method further comprising:

during clean fluid flow from said annular sealed interval through said ~~In~~inlet port, directing at least some of said clean fluid flow within said annular cup skirt of said lower packer and cleaning the interior of said annular cup skirt of any treatment fluid residue.

13. (currently amended) Apparatus for cleaning a selected interval within a well having a well casing perforated at the selected interval, comprising:

a formation treatment tool defining a fluid supply passage and a dump passage and being conveyed by fluid supplying tubing to the selected interval, said fluid supply passage being in communication with the fluid supplying tubing;

spaced straddle packer elements supported by said formation treatment tool and defining the selected interval within the well casing;

an ~~Out~~outlet port defined by said formation treatment tool and communicating said fluid supply passage with the selected interval between said spaced straddle packer elements and the well casing and an ~~In~~inlet port communicating the selected interval with said dump passage;

a dump valve in communication with said dump passage, said dump valve being open for draining fluid from the fluid supplying tubing and fluid supply passage and selected interval and dump passage within a predetermined range of low fluid flow and closed when fluid flow is above said predetermined range of low fluid flow; and

a bypass passage extending through said formation treatment tool and having bypass inlet and outlet openings in communication with the well casing outside the selected interval.

14. (currently amended) The apparatus of claim 13, wherein:

at least one of said ~~Out~~outlet port and said ~~In~~inlet port define flow transitioning geometry establishing gradual transition of fluid flow relative to the selected interval.

15. (currently amended) The apparatus of claim 14, wherein said flow transitioning geometry comprises:

inclined ~~Out~~outlet port surfaces establishing gentle angular transition of fluid flow from said fluid supply passage through said ~~Out~~outlet port and into the selected interval.

16. (currently amended) The apparatus of claim 15, wherein:

said inclined ~~Out~~outlet port surfaces are sufficiently spaced to define an ~~Out~~outlet port opening having a cross-sectional dimension at least as great as the cross-sectional dimension of said fluid supply passage and minimizing the velocity of fluid flow through said ~~Out~~outlet port.

17. (currently amended) The apparatus of claim 14, further comprising:

a flow diverter member located within said formation treatment tool and having an end defining a flow diverting geometry diverting fluid flow from said fluid supply passage to said ~~Out~~outlet port along a flow path having ~~gentle~~ bends less than 90 degrees.

18. (original) The apparatus of claim 17, wherein:

said flow diverter member is composed of a material having characteristics of controlled erosion by formation treatment fluid.

19. (currently amended) The apparatus of claim 13, wherein:

said spaced straddle packer elements comprise upper and lower cup packer elements each defining a resilient packer cup, said lower packer cup defining a fluid flow transition portion of said ~~In~~inlet port and transitioning fluid flow from said selected interval through said ~~In~~inlet port.

20. (currently amended) The apparatus of claim 13, wherein:

said lower packer cup is positioned and oriented for internal cleaning thereof by clean fluid flowing through said ~~In~~inlet port from said selected interval.

21. (currently amended) The apparatus of claim 13, wherein:

said formation treatment tool has upper and lower ends;

said spaced straddle packer elements comprise upper and lower cup packer elements, said upper cup packer element is located near said upper end of said formation treatment tool and said lower cup packer element is located near said lower end of said formation treatment tool; and

said ~~Out~~outlet port is located immediately below said upper cup packer element and said ~~In~~inlet port is located immediately above said lower cup packer element and in position for cleaning of said lower cup packer element by fluid flowing through said ~~In~~inlet port.

22. (original) The apparatus of claim 13, further comprising:

filter members positioned to filter out particulate from fluid flowing into and from said inlet and outlet bypass openings.

23. (original) The apparatus of claim 13, wherein:

said dump valve has dump ports and a valve seat, and comprises

a dump valve actuator having a valve element having an open position permitting flow of fluid from said dump passage through said dump ports and being movable to a closed position with said valve element in engagement with said valve seat blocking flow from said dump passage through said dump ports.

24. (original) The apparatus of claim 23, wherein:

said dump valve actuator defines a flow passage therethough, and further comprises

an urging member applying an urging force to said dump valve actuator urging said dump valve actuator toward said open position; and

an orifice located within said flow passage of said dump valve actuator developing a resultant force acting on said dump valve actuator in opposition to said urging force responsive to flow of fluid through said orifice, said resultant force moving said dump valve actuator to a position closing said dump valve when fluid flow through said orifice reaches a predetermined rate.

25. (currently amended) A~~n Out/In~~ straddle tool for treating selected intervals in wells having a well casing, comprising:

an ~~Out~~outlet mandrel having a fluid supply passage and defining an ~~Out~~outlet port through which fluid flows from said fluid supply passage into a selected interval annulus between the well casing and said ~~Out/In~~ straddle tool;

an upper packer mounted to said ~~Out~~outlet mandrel immediately above said ~~Out~~outlet port establishing sealing of said ~~Out~~outlet mandrel with the well casing;

an ~~In~~inlet mandrel having a fluid dump passage and located below said ~~Out~~outlet mandrel, said ~~In~~inlet mandrel defining an ~~In~~inlet port through which fluid flows from the selected interval annulus into said fluid dump passage;

a lower packer mounted to said ~~In~~inlet mandrel establishing sealing of said ~~In~~inlet mandrel with the well casing;

a pressure responsive dump valve controlling flow of fluid through said fluid dump passage and being open to permit flow when the fluid flow rate is below a predetermined flow rate and being closed to block flow when the fluid flow rate is above a predetermined flow rate; and

a bypass passage defined by said ~~Out/In~~ straddle tool and having bypass openings in communication with the casing-tool annulus above and below said upper and lower packers.

26. (currently amended) The ~~Out/In~~ straddle tool of claim 25, further comprising:

a tubular straddle spacer member interconnecting said ~~Out~~outlet mandrel and said ~~In~~inlet mandrel and being of sufficient length to cause sealing of said upper and lower packers with said well casing above and below the selected interval.

27. (currently amended) The ~~Out/In~~ straddle tool of claim 26, wherein:

said tubular straddle spacer member is composed of a plurality of interconnected straddle spacer sections and defines an overall tool length accommodating the length of the selected interval.

28. (currently amended) The ~~Out/In~~ straddle tool of claim 26, further comprising:

a shunt tube located within said tubular straddle spacer member and defining a shunt flow passage in communication with said fluid dump passage;

at least one shunt valve located intermediate the length of said shunt tube and ported through said tubular straddle spacer member to the casing-tool annulus of the selected interval; and wherein

said dump valve is in communication with said shunt flow passage.